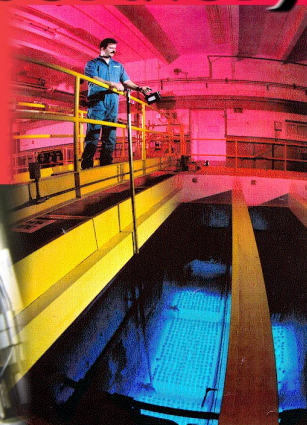


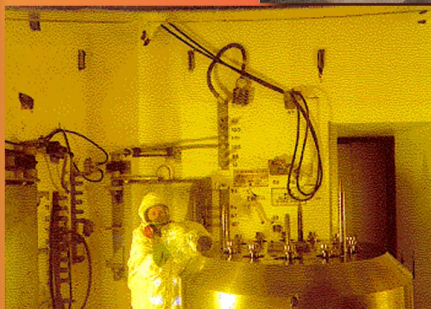
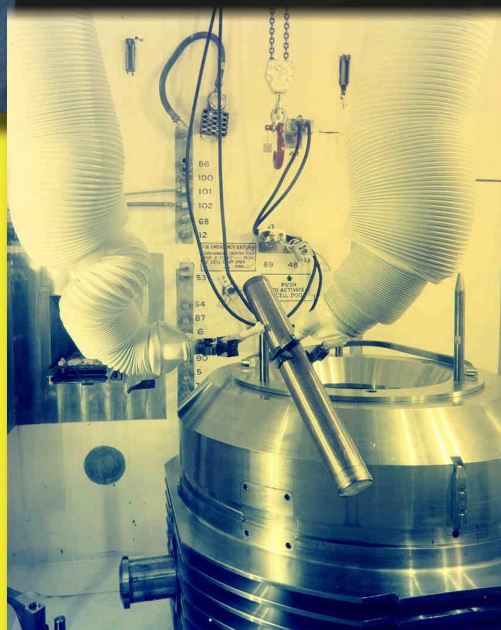
NONACTINIDE ISOTOPES AND SEALED SOURCES MANAGEMENT GROUP



Disposition Plan for Pacific Northwest National Laboratory



**Complexwide Resources
Solving Site Specific Problems**



**U.S. Department of Energy
June 2001**

Nonactinide Isotopes & Sealed Sources Management Group (NISSMG)



Nonactinide Isotopes and Sealed Sources Material Management and Disposition Plan for Pacific Northwest National Laboratory (PNNL)

Complex-Wide Resources Solving Site Specific Problems

Background

The Nuclear Material Stewardship Program (NMSP) is chartered by the Department of Energy's (DOE) Office of Environmental Management (EM) Office of Integration and Disposition (EM-20) to integrate and coordinate the management of excess nuclear materials across the DOE complex. At the NMSP "To Be Determined" (TBD) Initiative for Material Disposition Mapping Workshop held in Richland, Washington, March 12 to 13, 2001, Pacific Northwest National Laboratory (PNNL) provided their draft baseline plan for nuclear disposition. A number of concerns were raised on the disposition planning for these materials. As a result, PNNL requested NMSP's Nonactinide Isotope and Sealed Source Management Group (NISSMG) to provide assistance by developing alternate management and disposition options.

The NISSMG is devoted to helping EM achieve their site closure and other missions through effective and integrated cradle-to-grave management of nonactinide isotopes and sealed sources (NISS) in a way that:

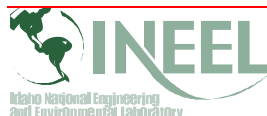
1. Provides corporate management and coordination,
2. Provides cost savings and budgetary efficiencies,

3. Promotes continued risk reduction,
4. Advances integrated management of nuclear materials, and
5. Results in improved effectiveness.

The NISSMG assists the DOE sites with the storage, reuse, disposition, transportation, and processing of these materials. Wherever possible and practical, the NISSMG attempts to find disposition solutions that focus on recycle and reuse of these special isotopes and sources, consistent with the DOE pollution prevention and waste minimization goals.

For PNNL, the NISSMG reviewed the baseline plans to understand the logic underlying their disposition strategy. Then the NISSMG identified alternative paths to disposition as well as beneficial reuse or recycle options for these PNNL materials.

At this time, it does not appear that there are any timing considerations or facility closure issues that would drive the site or programmatic desire for disposition of certain NISS streams.



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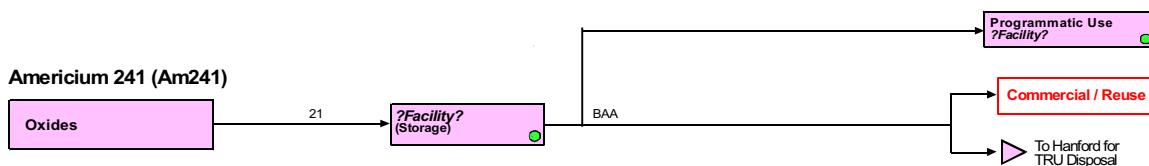


Americium 241

The amount of Americium 241 (^{241}Am) material is small (11 grams distributed in 21 items) and the current plans are to transfer this material to the Hanford transuranic waste (TRU) program. The material does not have a Defense Programs' legacy, and so cannot be disposed of at the Waste Isolation Pilot Plant (WIPP) as transuranic waste. Although the current plan does indeed solve the immediate PNNL problem, this solution adds to the larger problem of what to do with non-defense TRU at Hanford. Two alternatives exist for this material: The first

is to send it to the Los Alamos National Laboratory (LANL) for use in their isotope sales program or in their research and development program. The second alternative is to send it for commercial reuse, as ^{241}Am is the primary actinide used for the production of commercial Nuclear Regulatory (NRC) licensed neutron sources, and is used in the production of ionization smoke detectors. Both of these options assume the material is high purity ^{241}Am .

Recommendation: Characterize the ^{241}Am material to determine the purity, then contact LANL on the possibility of transferring the material. Second, if LANL has no interest, then consider commercial use as neutron source material. If the material is not pure enough for reuse, then transfer to Hanford TRU program.

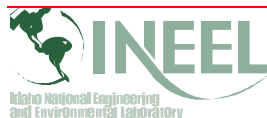
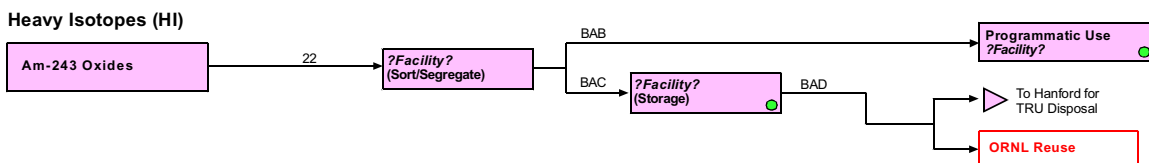


Heavy Isotopes (Americium 243)

The amount of material is small (3 grams distributed in 22 items) and current plans are to transfer this material to the Hanford TRU program. The material does not have a Defense Programs' legacy and cannot be disposed of at WIPP. Although this may solve the PNNL problem, it adds to the larger problem of final disposition of non-defense TRU at Hanford.

The Oak Ridge National Laboratory (ORNL) uses ^{243}Am for isotope redistribution and research and development and generally is willing to accept this material, if it is high purity. A logical alternative to a non-defense TRU disposition path is the reuse and recycle option via ORNL.

Recommendation: Transfer the ^{243}Am to ORNL for reuse.



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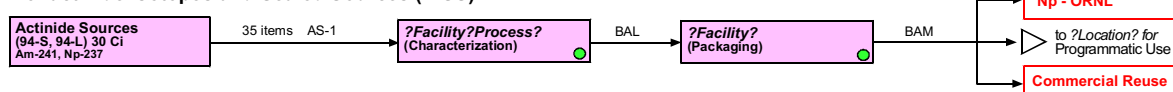
Actinide Sources – stream AS-1

This material stream has 35 items with 30 curies (Ci) of total activity and two isotopes (^{241}Am and ^{237}Np). It is unclear how many of these items are in active service and how many are excess to PNNL needs. They probably do not have a defence legacy pedigree. The planned disposition path is yet to be determined (TBD) for those items excess to PNNL needs.

Several options are available for these materials. First, ORNL is actively seeking sources of ^{237}Np ; second, LANL, who is the repository for excess ^{241}Am in the complex, might take it; and third, since Am-241 is the primary isotope used for the production of commercial NRC licensed neutron sources, commercial use is an option. These options assume the material is high purity ^{241}Am .

Recommendation: Determine which sources are excess to PNNL needs. Characterize the material to determine the purity, then contact ORNL on the possibility of transferring the ^{237}Np . Second, if LANL has no interest in the ^{241}Am , then consider commercial use as neutron source material. If the material is not pure enough for reuse, then transfer it to the Hanford TRU program.

Nonactinide Isotopes and Sealed Sources (NISS)



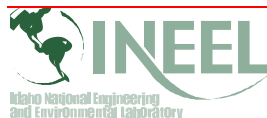
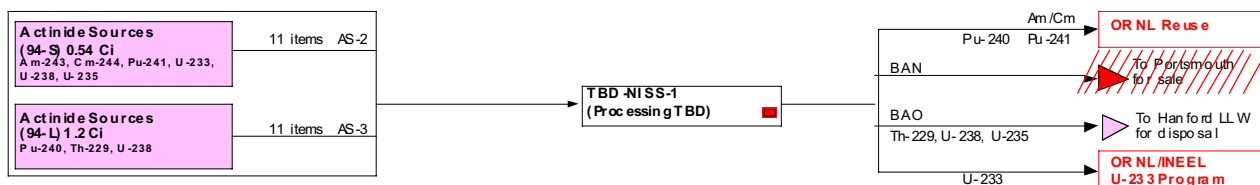
Actinide Sources – streams AS-2 & AS-3

These material streams consist of 22 sources (both liquid and solid) having 1.74 Ci of activity and eight different isotopes (^{229}Th , ^{233}U , ^{235}U , ^{238}U , ^{240}Pu , ^{241}Pu , ^{243}Am , and ^{244}Cm). They probably do not have a defence legacy pedigree. Current baseline planning calls for these items to be disposed of at Hanford as low level waste (LLW), or to be shipped to Portsmouth for sale. The non-uranium and non-thorium isotopes could be included in Hanford's Plutonium Finishing Plant (PFP) plutonium project and ultimately disposed of as high level waste (HLW) as part of the fissile material disposition

program at the Savannah River Site (SRS). However, these items could also be reused at ORNL through their isotope production program, thus providing a beneficial reuse option. ORNL and INEEL are consolidating all excess ^{233}U at this time and possibly would consider this isotope for inclusion in their programs.

The uranium sources are so small, it is doubtful that Portsmouth would agree to store or resell them. These sources logically should be disposed of as LLW on site at Hanford.

Recommendation: Utilize the reuse option through ORNL for the non-uranium, non-thorium source materials, and dispose of the thorium and uranium as LLW.



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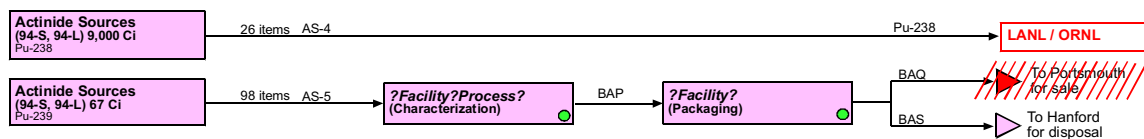
Actinide Sources – streams AS-4 & AS-5

This stream consists of 26 items of ^{238}Pu with 9000 Ci of activity, and 96 items of ^{239}Pu with 67 Ci of activity. Current baseline plans are to either ship to Portsmouth for sale, or inclusion in the PFP program. However, Portsmouth is neither markets or stores plutonium. The ^{238}Pu and ^{239}Pu might be included in the Hanford PFP program and ultimately be disposed as HLW after immobilization processing at SRS. Reuse is

not only the more logical path for this material, it may be the path of least resistance.

Little, if any, excess ^{238}Pu exists in the complex. There are two sites (ORNL and LANL) that are receiving these isotopes for use to support a future NE-50 mission in supplying radioactive thermoelectric generators (RTGs) for the National Aeronautics and Space Administration (NASA) Space Program

Recommendation: Transfer the ^{238}Pu to LANL for reuse as RTGs supporting the Space Program. Transfer the ^{239}Pu to the Hanford PFP Program.



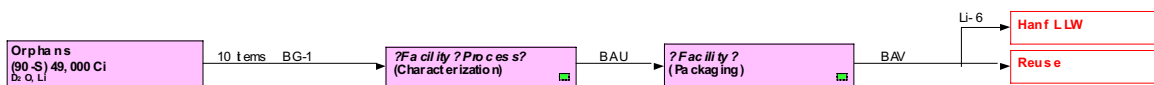
Orphans – stream BG-4

This waste stream has 8 items of deuterium and lithium carbonate (in the form of ^6Li) with 49,000 curies of activity that are shown going to the Hanford High Level Waste Vitrification Program. Lithium and deuterium inventory data indicate these materials are still in programmatic use. Any lithium that becomes excess to PNNL

can be disposed as LLW, as the lithium carbonate form is non reactive.

Deuterium can be reused to moderate fission reactions in certain nuclear reactors, and the NISSMG receives periodic inquiries for this isotope.

Recommendation: Dispose of the lithium as LLW. Continue to store the deuterium and pursue reuse options.



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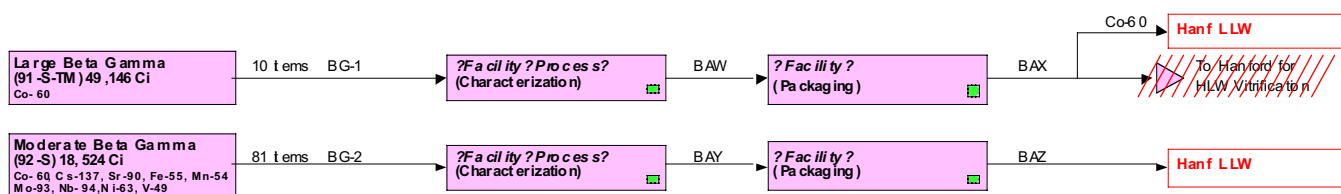


Large Beta Gamma & Moderate Beta Gamma – streams BG-1 & BG-2

The large beta gamma stream has 10 items (all Co-60) with a total activity of 49,000 Ci, and the moderate beta gamma stream shows 81 items with 18,500 Ci of activity. Current baseline plans are to transfer these materials to the Hanford High Level Waste Vitrification Program.

There is little reuse potential for this material. All of these items appear to easily fit within the Performance Assessment (PA) of the Hanford LLW disposal site and should be able to be disposed of as LLW.

Recommendation: Dispose as LLW at the Hanford LLW disposal site.

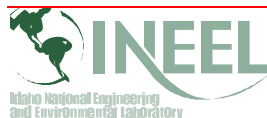
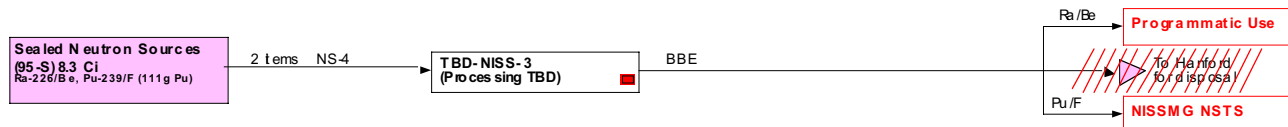


Sealed Neutron Sources – stream NS-4

This material stream has two items, the first is a radium and beryllium (Ra/Be) source that is still in programmatic use. The second item is a ^{239}Pu /fluoride (F) source containing 111 grams of ^{239}Pu and does not have a defense programs pedigree. The ^{239}Pu /F neutron source is a true

orphan material at this time. Disposal options for this item are being evaluated as part of the NISSMG Neutron Source Trade Study and when disposal options are identified the NISSMG will assist PNNL in implementing an acceptable option.

Recommendation: Transfer the ^{239}Pu /F source to SRS and dispose as part of the SRS demonstration project.



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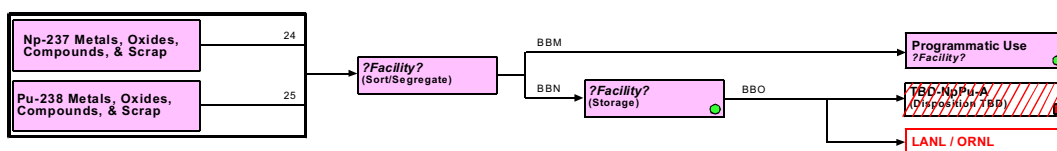
Neptunium 237 and Plutonium 238 – streams 24 & 25

Current inventory data indicate that these streams consist of eight items (94 grams) of ^{237}Np that are excess to PNNL needs. Disposition plans are TBD.

ORNL is accepting ^{237}Np to support future NE-50 mission in supplying RTGs for the Space Program.

Again, little if any excess ^{238}Pu exists in the complex, but two sites (ORNL and LANL) are receiving this isotope for use to support future NE-50 mission in supplying RTGs for the Space Program.

Recommendation: Transfer the ^{237}Np to ORNL and transfer the ^{238}Pu to LANL for reuse at RTGs supporting the Space Program.



Conclusions

Many of the disposition paths for NISS materials at Hanford hand off to the Hanford TRU waste program. Unfortunately, for non-defense related materials, this path becomes a dead end, as the material cannot be disposed at WIPP. DOE, as a whole, needs to pursue a resolution to this problem.

On the other hand, DOE's Department of Energy's Isotope Production and Distribution Program (NE) provides a wide range of isotope products and services to customers worldwide, and have a need for high purity NISS materials. These radioisotopes and enriched stable isotopes are distributed for research or development purposes, medical diagnoses and therapy, industrial, agricultural, and other useful applications that are in the national interest. The major laboratories that have these services are Brookhaven National Laboratory, LANL and ORNL.

A number of alternative disposition paths have been identified for Hanford's NISS materials in

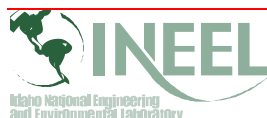
this report. Wherever possible, reuse and recycle were pursued rather than waste designation and disposal. Hanford should continue to research the possibility of reuse wherever possible, even if this means pursuing storage at another facility, until a reuse option becomes available. NISSMG technical staff is ready to provide assistance to PNNL in the implementation of its recommendations.

For information or assistance from NISSMG contact:

□ Jim Low (DOE/AL)
(505) 845-5458
jlow@doeal.gov

□ Gary Polansky
(505) 845-7029
gfpolan@sandia.gov

□ Dave Parks (INEEL)
(208) 526-0486
dlp@inel.gov



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